1966 OPERATING SUMMARY

DUNNVILLE (REGIONAL) water treatment plant

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Dunnville Local Advisory Committee,
Dunnville, Ontario.

Gentlemen:

We are pleased to submit to you the 1966 Operating Summary for the Dunnville Regional Water Treatment Plant, OWRC Project No. 58-W-17.

It is hoped that our joint participation in efforts to protect your water supply will have even more success in the coming year.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am happy to present you with the 1966 Operating Summary for the Dunnville Water Treatment Plant, OWRC Project No. 58-W-17.

The report offers a concise summary of operating data for the year and comparisons with previous years where these are applicable and significant.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

● This operating summary contains complete information on the management of the project during 1966. It contains a concise review of the year's plant operation, significant financial details, and a visual presentation in graphs and charts of technical performance.

The information will be of value to interested parties in assessing the adequacy of the project at this time and its ability to meet future requirements.

The report is the result of co-operation by several groups within the Division of Plant Operations. These include the statistics section and the technical publications section. The Division of Finance and the draughting section of the Division of Sanitary Engineering were also closely associated with its publication.

The Regional Operations Engineer, however, has had the primary responsibility for the content, and will be happy to answer any questions regarding it.

CONTENTS

DUNNVILLE REGIONAL
water treatment plant

operated for

THE TOWN OF DUNNVILLE

SHERBROOKE METALLURGICAL COMPANY LIMITED

THE ELECTRIC REDUCTION COMPANY LIMITED

by the

ONTARIO WATER RESOURCES COMMISSION

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: R. S. McKittrick

801 Bay Street Toronto 5

'66 REVIEW

The total flow during the past year was 3802.11 million gallons for an average daily plant output of 10.42 million gallons. This is a slight increase over the average daily flow in 1965 of 10.12 million gallons.

The total operating cost per thousand gallons was 2.60¢ as opposed to 2.67¢ in 1965 and the total cost which includes operating, interest on the capital debt, debt retirement and reserve fund charges was 8.12¢ per thousand gallons as opposed to 8.44¢ in 1965.

On March 11, it was necessary to take the 16-inch Dunnville main out of service while a break was repaired at the south wingwall of the Dunnville bridge. Due to the location of the break and the resulting danger to the bridge structure, re-location of the line was the most practical solution to the problem and this was the course of action followed. The line was placed back in service on March 25 with the costs of the repair deducted from the Town of Dunnville reserve account.

Shut down of the Port Maitland main was necessary in September to allow the repair of a leak in the Sherbrooke Metallurgical Administration building. The costs of this repair were borne by the Sherbrooke reserve account.

On August 15 the plant sub-station was struck by lightning with subsequent damage to a secondary bushing and the secondary cables. A complete shut down of the plant was necessary to allow for emergency

repairs. Further repairs were made during the industrial shut down in September. A contract is presently outstanding for the complete replacement of all secondary cables and this will be completed in May 1967. Total cost of the above repairs is approximately $6,000, half of which amount will be covered by insurance.

A study was initiated in 1966 to investigate the following areas of concern at the plant:

1. Frazil ice - To determine the most economical method of elimination of ice blockages during winter months.

2. Low lift pump - To increase the pumping capacity of the low lift pumping station.

3. Travelling water screens - To investigate the possibility of installing these in the low lift station and to estimate the cost of the installation.

4. High lift pump controls - To investigate the requirements and ramifications in automation of the high lift pumps.

5. Participant metering - To investigate any deficiencies which exist.

The consultants' report on the above items is expected in mid-1967.

PROJECT COSTS

Long Term Debt to OWRC - (Revised Estimated)

Dunnville	$ 546,880.86	
Electric	$1109,956.28	
Sherbrooke	$ 911,769.49	
		$2,568,606.63

Debt Retirement Balance at Credit (Sinking Fund) December 31, 1966

Dunnville	$ 76,685.96	
Electric	$ 157,585.40	
Sherbrooke	$ 129,763.47	
		$ 364,034.83

The total cost to the participant during 1966 was as follows:

Net Operating		
Dunnville	$ 21,073.61	
Electric	42,770.83	
Sherbrooke	35,139.19	$ 98,983.63
Debt Retirement		
Dunnville	$ 11,033.49	
Electric	22,392.76	
Sherbrooke	18,394.44	$ 51,820.69
Reserve		
Dunnville	$ 2,717.01	
Electric	5,686.60	
Sherbrooke	4,891.36	$ 13,294.97
Interest Charges		
Dunnville	$ 30,758.66	
Electric	62,427.53	
Sherbrooke	51,288.53	$ 144,474.72
TOTAL		$ 308,574.01

RESERVE ACCOUNT

Balance at January 1, 1966		
Dunnville	$ 17,562.64	
Electric	36,055.42	
Sherbrooke	29,472.28	$ 83,090.34
Deposited by Participant		
Dunnville	$ 2,717.01	
Electric	5,686.60	
Sherbrooke	4,891.36	$ 13,294.97
Interest Earned		
Dunnville	$ 851.28	
Electric	2,117.20	
Sherbrooke	1,727.46	$ 4,695.94
Less Expenditures		
Dunnville	$ 4,211.95	
Electric	-	
Sherbrooke	1,214.58	$ 5,426.53
Balance at December 31, 1966		
Dunnville	$ 16,918.98	
Electric	43,859.22	
Sherbrooke	34,876.52	$ 95,654.72

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	7305.21	2917.66	-	165.95	3537.79	-	55.43	187.61	455.92	-	(15.15)
FEB	7127.10	2862.72	-	196.92	3249.55	-	194.80	62.73	481.54	78.84	
MARCH	5534.53	2997.87	-	150.75	3160.69	-	221.86	-	(1213.63)	216.99	
APRIL	9020.57	4774.17	-	159.97	2865.23	-	167.44	-	879.61	189.25	(15.00)
MAY	7725.73	2901.51	105.12	94.32	2955.68	(85.00)	399.27	11.40	1302.90	100.53	
JUNE	8762.98	3203.56	262.64	46.25	3046.08	910.00	111.12	240.76	117.72	824.85	
JULY	6914.07	2870.62	249.52	-	3080.18	-	230.60	5.58	341.49	155.87	(19.79)
AUG	7607.12	3109.58	250.03	-	3653.43	52.50	119.04	227.64	136.99	57.91	
SEPT	10120.67	4675.66	378.22	-	3597.18	910.00	138.28	-	339.16	82.17	
OCT	8984.54	3336.97	172.49	11.78	2871.83	150.00	96.76	-	494.64	1886.10	(36.03)
NOV	7893.08	3044.15	-	23.80	3033.48	353.00	195.37	284.73	773.82	184.73	
DEC	11987.93	3101.12	-	48.12	2998.43	5.29	439.82	268.70	4997.71	144.24	(15.00)
TOTAL	98983.63	39795.59	1418.02	897.86	38049.55	2295.79	2309.29	1289.15	9107.87	3921.48	(100.97)

BRACKETS INDICATE CREDIT

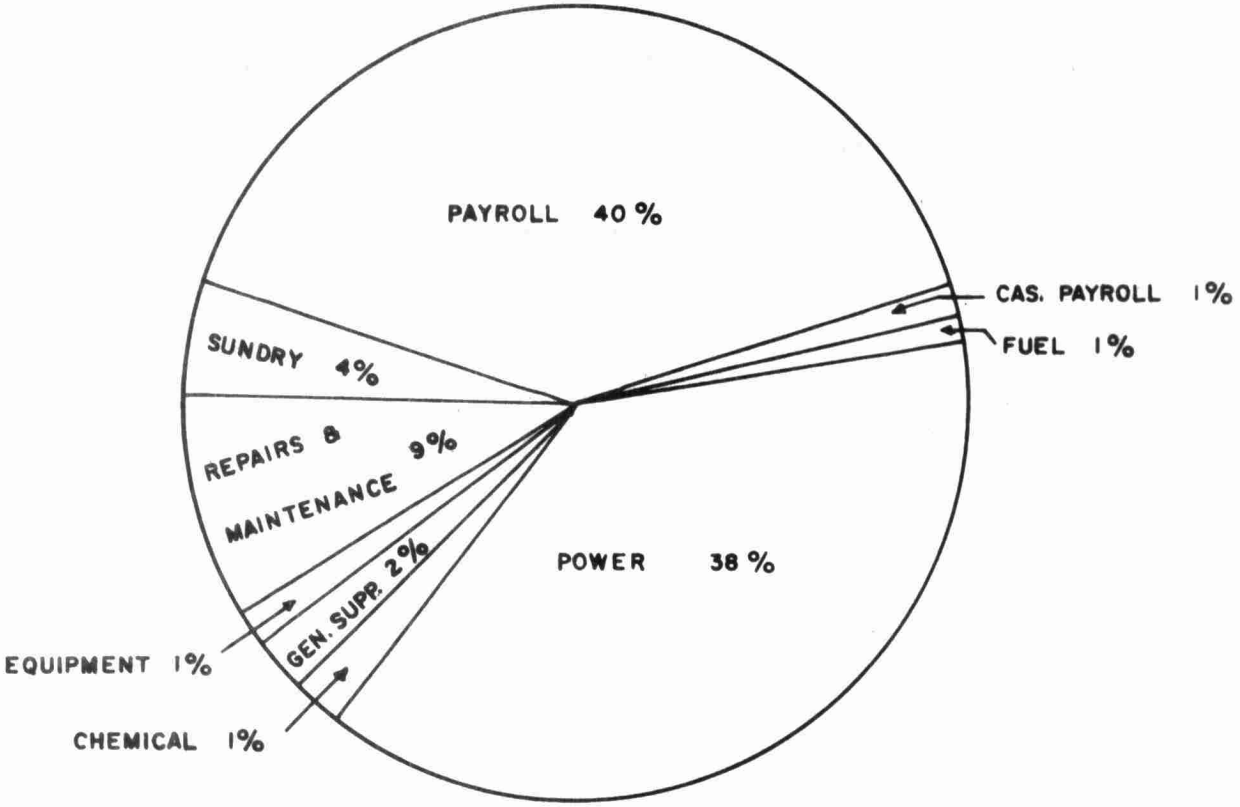
SUMMARY OF WATER COSTS

Year	M. G. Treated	Operating Cost	Operating Cost per 1,000 gallons	Total Cost	Total Cost per 1,000 gals.
1961	2245.838	$71,428.00	3.18¢	$276,047.37	12.29¢
1962	3214.853	85.564.88	2.66¢	297,494.48	9.25¢
1963	3726.935	95,458.82	2.56¢	309,179.48	8.29¢
1964	3719.568	99,095.96	2.66¢	312,663.35	8.40¢
1965	3692.889	98,485.34	2.67¢	311,630.93	8.44¢
1966	3802.109	98,983.63	2.60¢	308,574.01	8.12¢

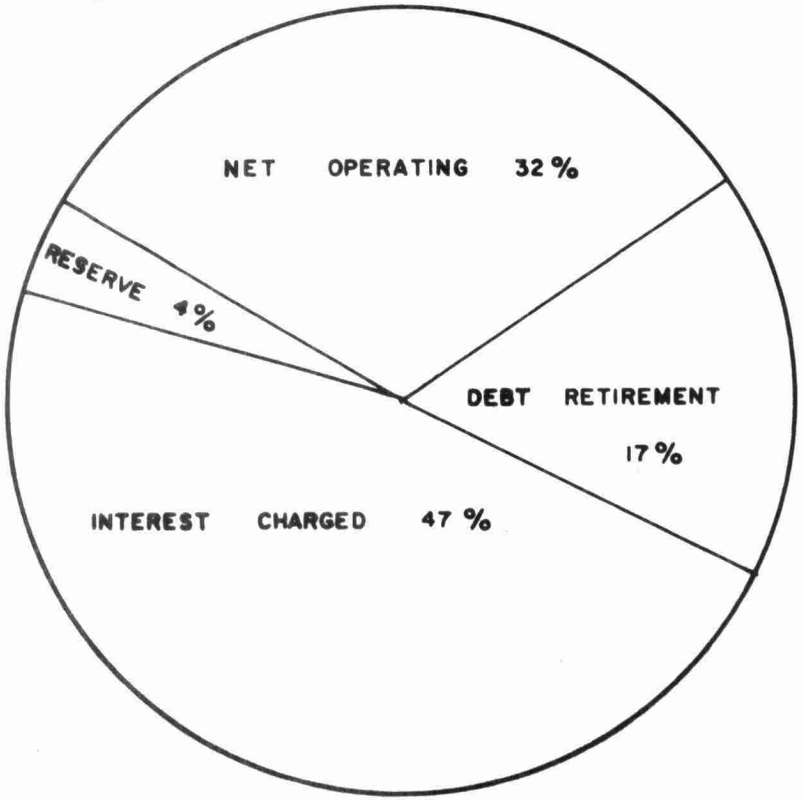
COST TO EACH PARTICIPANT IN 1966

Participant	M. G. Used	Operating Cost	Operating Cost per 1,000 gallons	Total Cost	Total Cost per 1,000 gals.
Town of Dunnville	345.169	18,430.75	5.34¢	65,582.77	19.00¢
Electric Reduction	1548.885	44,225.89	2.86¢	133,277.72	8.60¢
Sherbrooke Metallurgical	1908.055	36,326.99	1.90¢	109,713.52	5.75¢

1966 OPERATING COSTS



TOTAL ANNUAL COSTS



Process Data

GENERAL

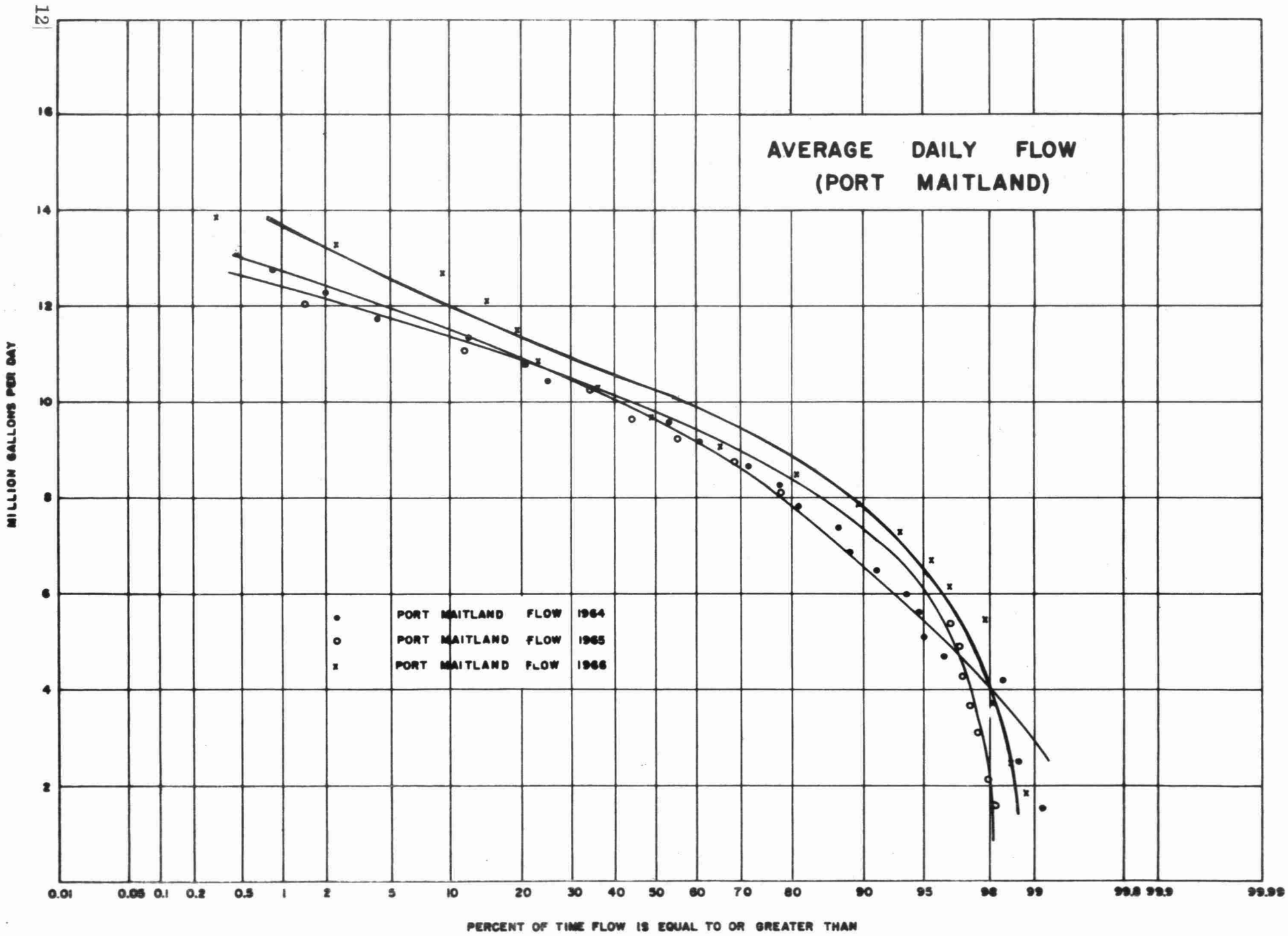
The treatment of water at the Dunnville plant consists of microstraining to remove such things as algae and gross solids, and disinfection by the addition of chlorine. The following data provides information regarding the output of the plant, the quality of the raw water, the quality of the treated water and chlorine dosages necessary to maintain safe water. The quality of the water is discussed using such terms as filterability and turbidity. An effort is made to define the meaning of these terms and graphs have been drawn to indicate the frequency of occurrence of various readings.

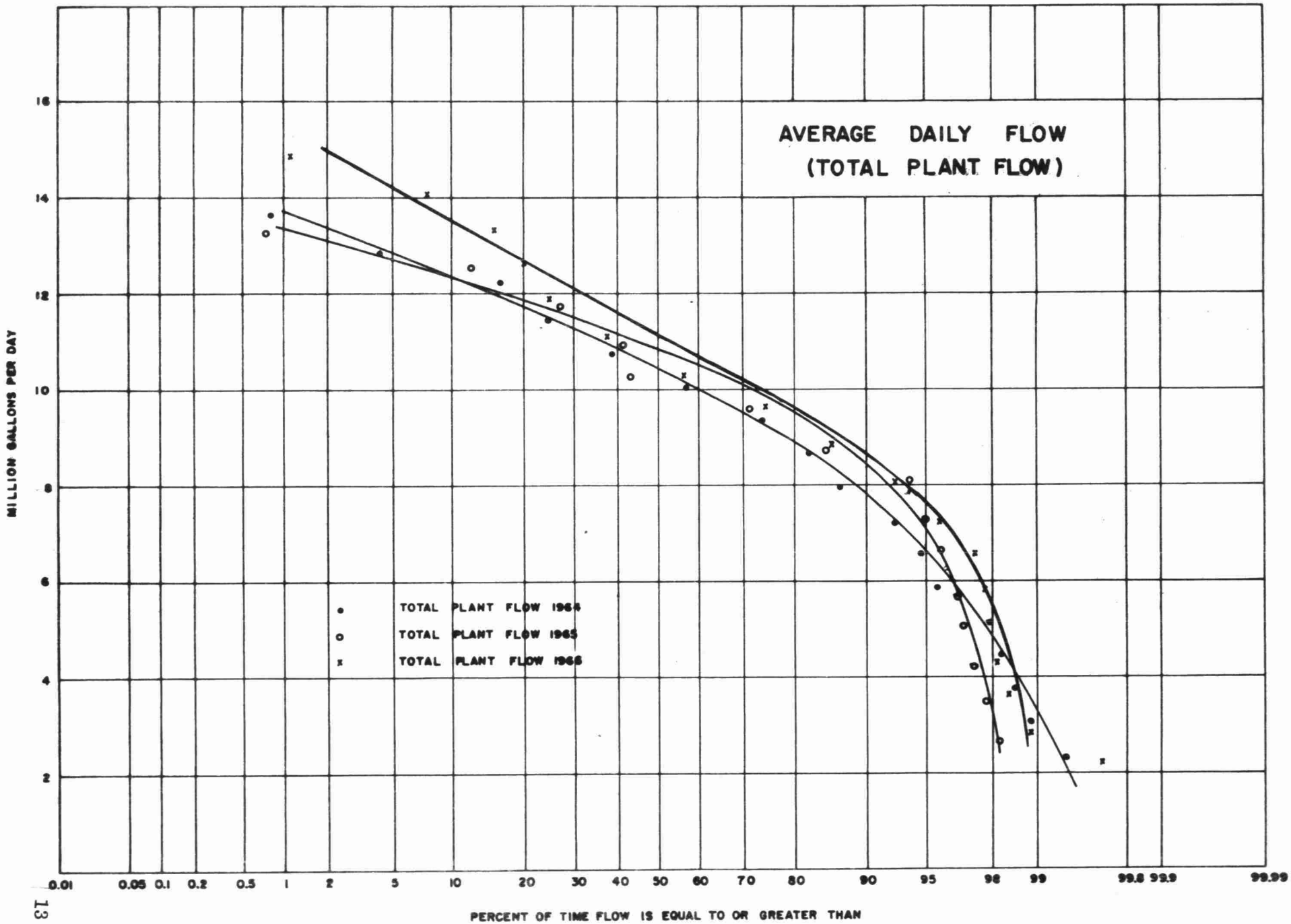
FLOW

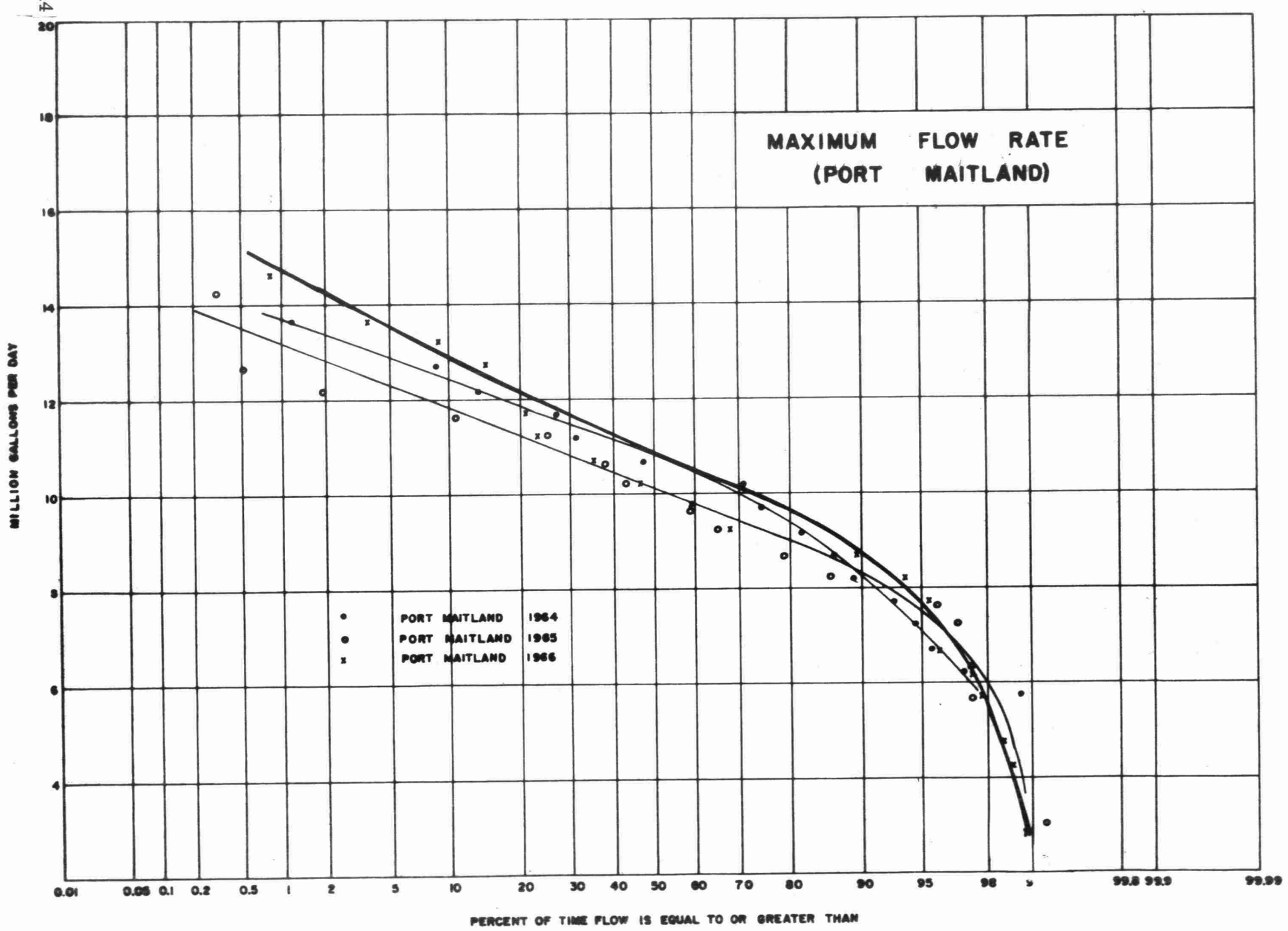
During 1966 a total of 3802.11 million gallons of treated water was pumped to the Port Maitland industries and the Town of Dunnville. This represents an increase of 2.9% over 1965. July was the peak month with an average daily flow for the month of 13.99 mg. The peak week was July 11-17 with an average daily flow for the week of 14.37 mg.

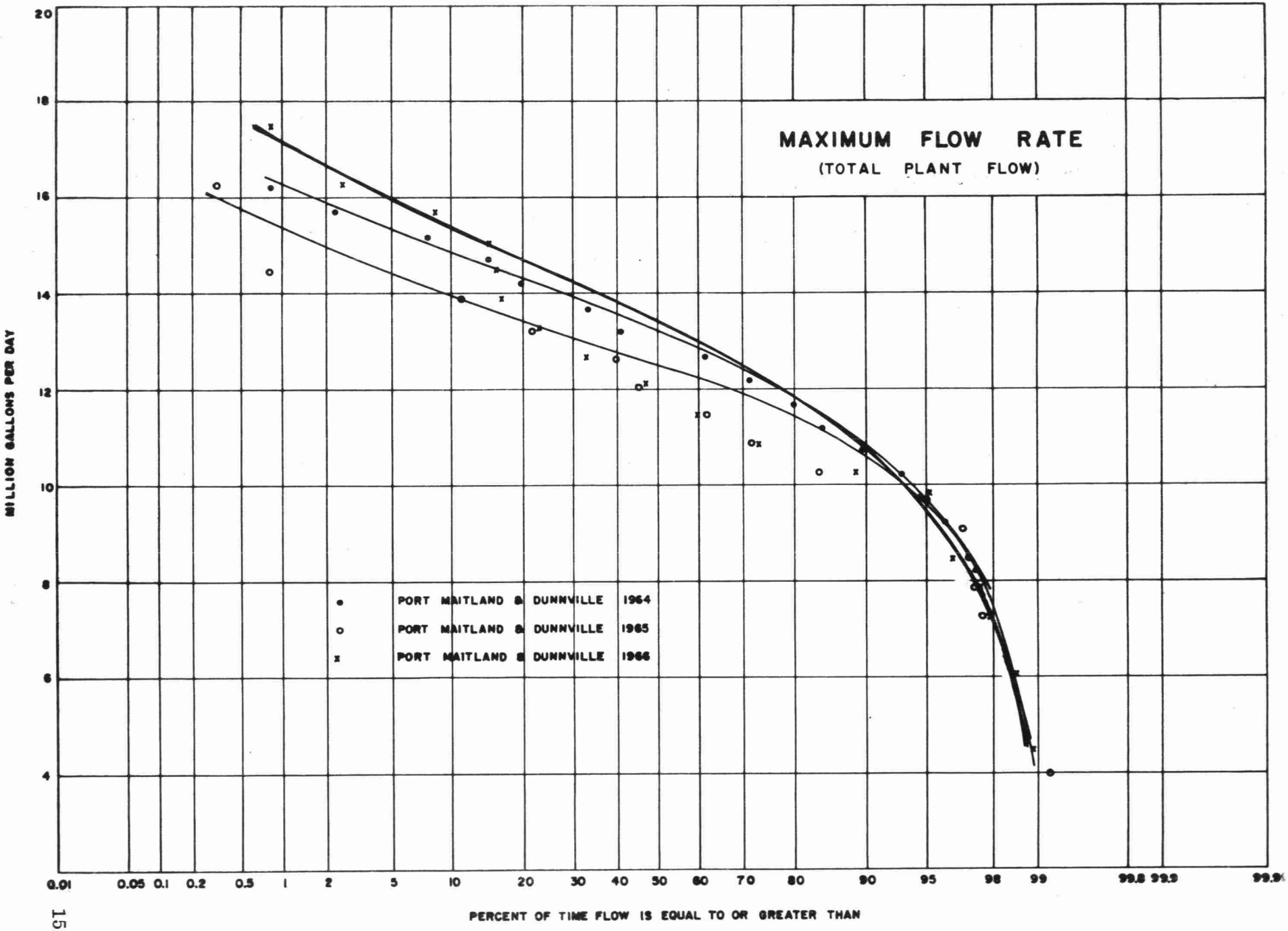
The average daily plant output for 1966 was 10.42 mg with the peak daily output of 14.89 mg occurring on July 26. The minimum daily flow of 1.54 mg occurred on September 14 during the industrial shutdown. The maximum flow rate at the plant occurred on July 13 with the Port Maitland industries demanding 14.54 mgd and the Town of Dunnville 3.10 mgd for a total instantaneous flow rate of 17.64 mgd.

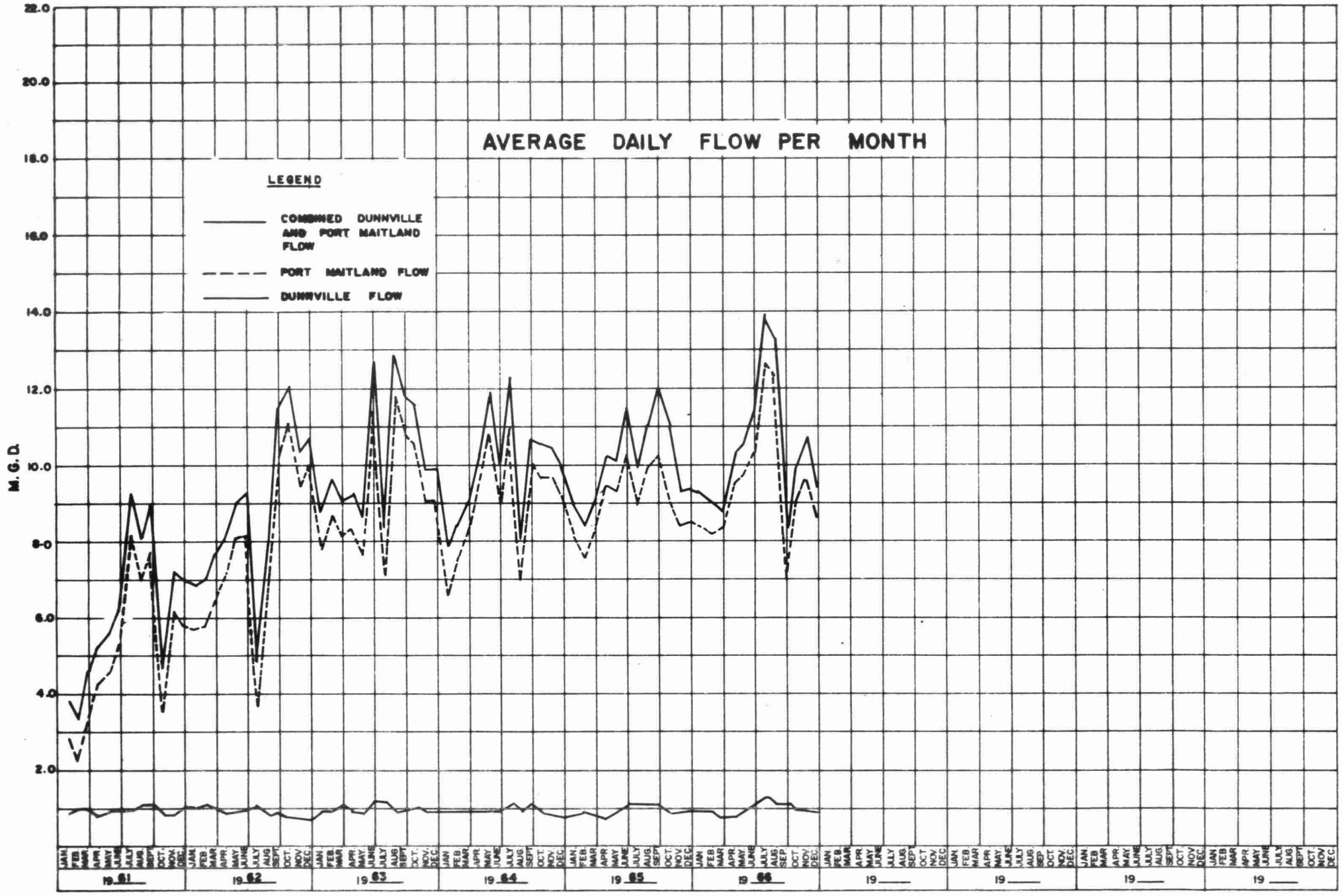
The maximum average daily flow for the Town of Dunnville for one week occurred for the period of July 4 to 10. The average daily flow for this period was 1.52 mg. July 25 to 31 was the peak week for the Port Maitland industries with an average daily flow for the period of 13.04 mg.


AVERAGE DAILY FLOW
(PORT MAITLAND)
MILLION GALLONS PER DAY
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN
PORT MAITLAND FLOW 1964
PORT MAITLAND FLOW 1965
PORT MAITLAND FLOW 1966
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
2
4
6
8
10
12
14
16


AVERAGE DAILY FLOW
(TOTAL PLANT FLOW)
TOTAL PLANT FLOW 1964
TOTAL PLANT FLOW 1965
TOTAL PLANT FLOW 1966
MILLION GALLONS PER DAY
16
14
12
10
8
6
4
2
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN

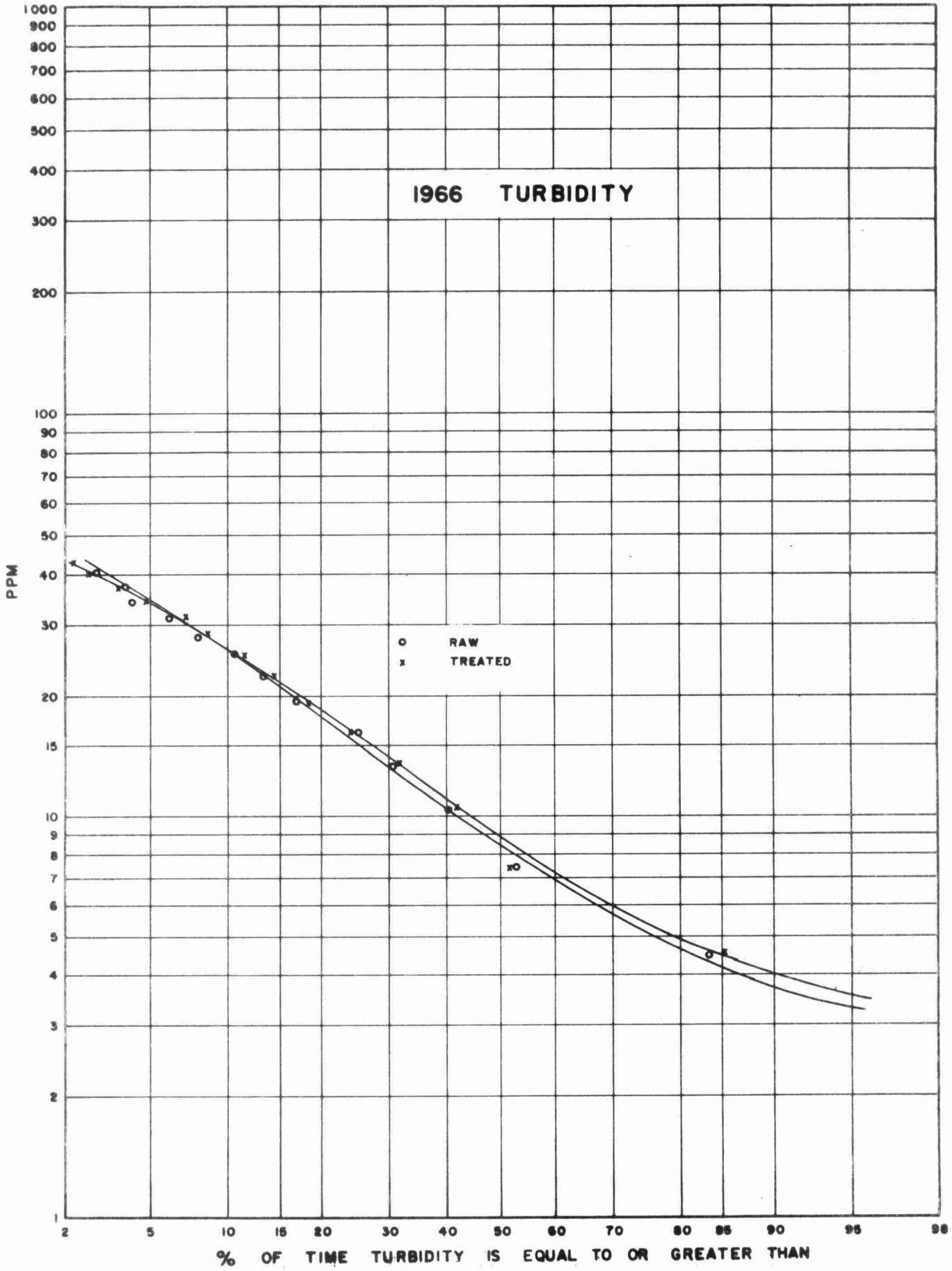

MAXIMUM FLOW RATE
(PORT MAITLAND)
PORT MAITLAND 1964
PORT MAITLAND 1965
PORT MAITLAND 1966
MILLION GALLONS PER DAY
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN
20
18
16
14
12
10
8
6
4
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99.8
99.9
99.99


MAXIMUM FLOW RATE
(TOTAL PLANT FLOW)
MILLION GALLONS PER DAY
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN
PORT MAITLAND & DUNNVILLE 1964
PORT MAITLAND & DUNNVILLE 1965
PORT MAITLAND & DUNNVILLE 1966
20
18
16
14
12
10
8
6
4
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.9%


AVERAGE DAILY FLOW PER MONTH
LEGEND
COMBINED DUNNVILLE AND PORT MAITLAND FLOW
PORT MAITLAND FLOW
DUNNVILLE FLOW
M.G.D.
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
19 61
19 62
19 63
19 64
19 65
19 66
19 ____

MONTHLY FLOWS

Month	Total Flow MG	Dunnville Town MG	Electric Reduction MG	Sherbrooke Metallurgical MG
January	286.424	26.734	120.419	139.271
February	254.120	24.180	97.186	132.754
March	274.299	14.879	116.564	142.856
April	211.116	24.786	125.314	161.016
May	330.048	27.028	135.067	167.953
June	343.539	33.549	121.681	188.309
July	433.691	39.851	171.646	222.194
August	411.994	34.684	174.035	203.275
September	236.970	32.140	112.766	92.064
October	308.529	30.349	124.865	153.315
November	321.104	29.164	125.266	166.674
December	290.275	27.825	124.076	138.374
Total	3802.109	345.169	1548.885	1908.055
% of Total	100.0	9.1	40.7	50.2
Average Daily	10.417	0.946	4.243	5.228


1966 TURBIDITY
PPM
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
o RAW
x TREATED
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% OF TIME TURBIDITY IS EQUAL TO OR GREATER THAN

TURBIDITY

The turbidity of water is a measure of the interference presented by suspended matter to the passage of light. This measurement therefore indirectly measures the suspended matter such as clay, silt, finely divided organic matter and microscopic organisms present in the air.

The microstrainers at the Dunnville Regional Treatment Plant are designed to remove only the larger micro-organisms, particularly algae. It can be seen from the accompanying graph on turbidity measurements that the treatment process does not significantly reduce the turbidity of the raw water. It may be deduced from these results that the major source of turbidity in the raw water is caused by substances smaller than can be removed by the microstrainers.

The OWRC standard for drinking water specifies a limit of 5 ppm. At the Dunnville plant the treated water met this standard 21% of the time.

BACTERIOLOGICAL ANALYSIS

A total of 195 samples was submitted to the OWRC laboratory for bacteriological analysis in 1966. Of these 49 samples were of raw water taken at the low lift station and 146 were treated water collected from the end of the Dunnville and Port Maitland mains and either Grandview School or Camp Goforth in Dunn Township. All of the 146 samples of treated water were classed as Grade "A" or satisfactory water.

CHEMICAL ANALYSIS

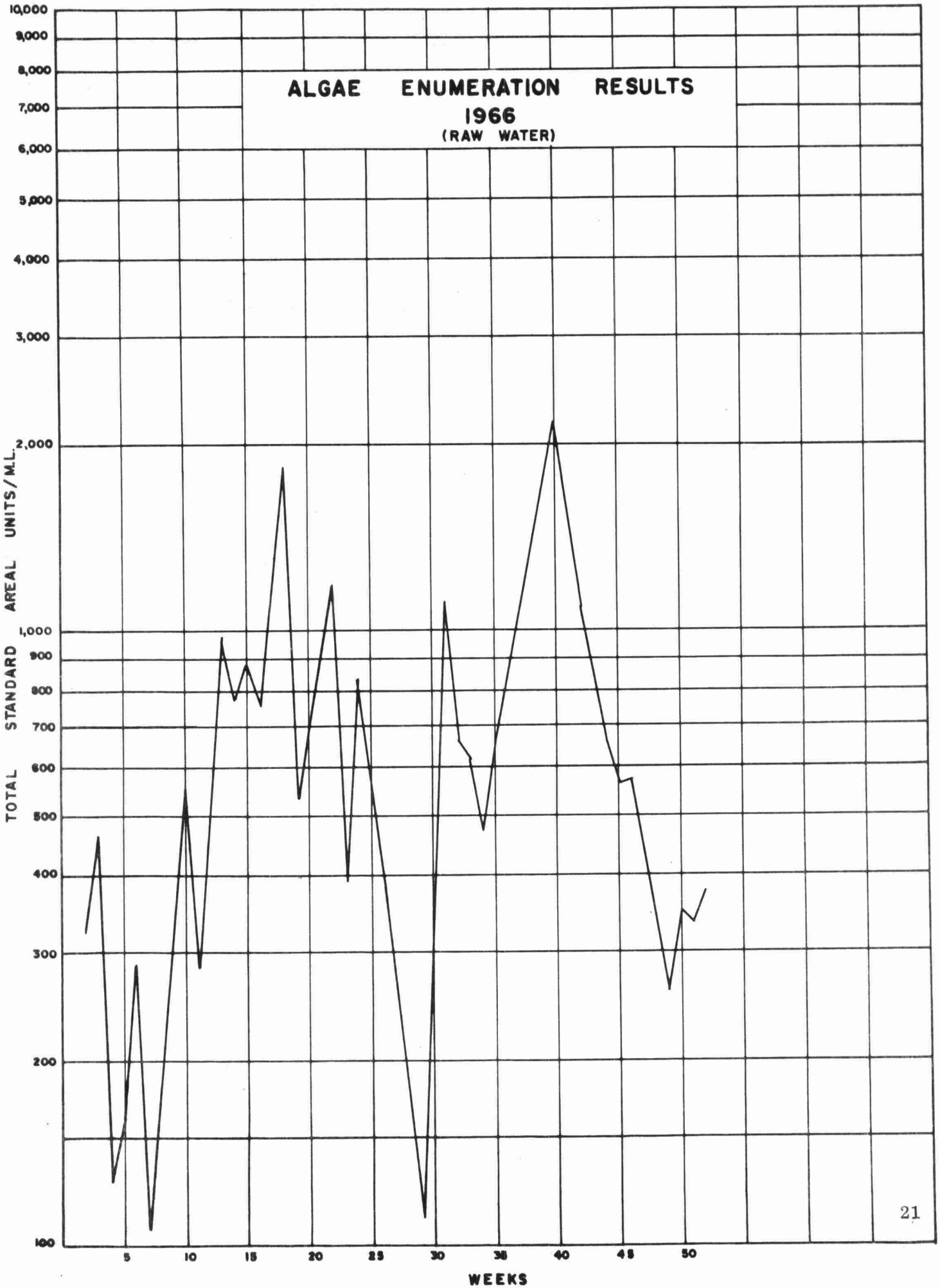
A total of 43 samples was submitted to the OWRC laboratory for chemical analysis during 1966. Approximately half of these samples were of the raw water and half were of the treated water. There is virtually no change between treated and raw water samples due to the dissolved nature of the chemicals and the yearly average values listed below may be considered as applicable to either raw or treated water. Included in the table below are 1965 and 1966 yearly averages and normally accepted standards for good quality water.

Description	Hardness As $CaCO_3$ (PPM)	Alkalinity As $CaCO_3$ (PPM)	Iron as Fe (PPM)	Chloride As Cl (PPM)	pH at Lab	Colour in Hazen Un.	Phenols in (ppb)	Sulphates as SO_4 (PPM)
Standard	< 100	30 to 100	< .03	< 350	6.7 to 8.5	< 15	< 2	< 250
1965 Yearly Average	139	100	0.50	26	8.7 to 7.7	< 6	< .1	30
1966 Yearly Average	148	100	0.47	27	8.4 to 7.7	< 7	< 1	30

ALGAE ENUMERATION AND IDENTIFICATION (see graph)

Algae, in addition to their ability to cause obnoxious tastes and odours, may modify the pH, alkalinity, colour, turbidity and radioactivity of the water. Corrosive activity of the water is often increased as a result of algae growth. Although there is no record of pathogenic species of algae toxic to humans there are algae which produce toxic organic substances causing the death of wild and domestic animals. Algae have been regarded with some suspicion in cases of a general outbreak of gastro-intestinal disorders among persons using a common water supply.

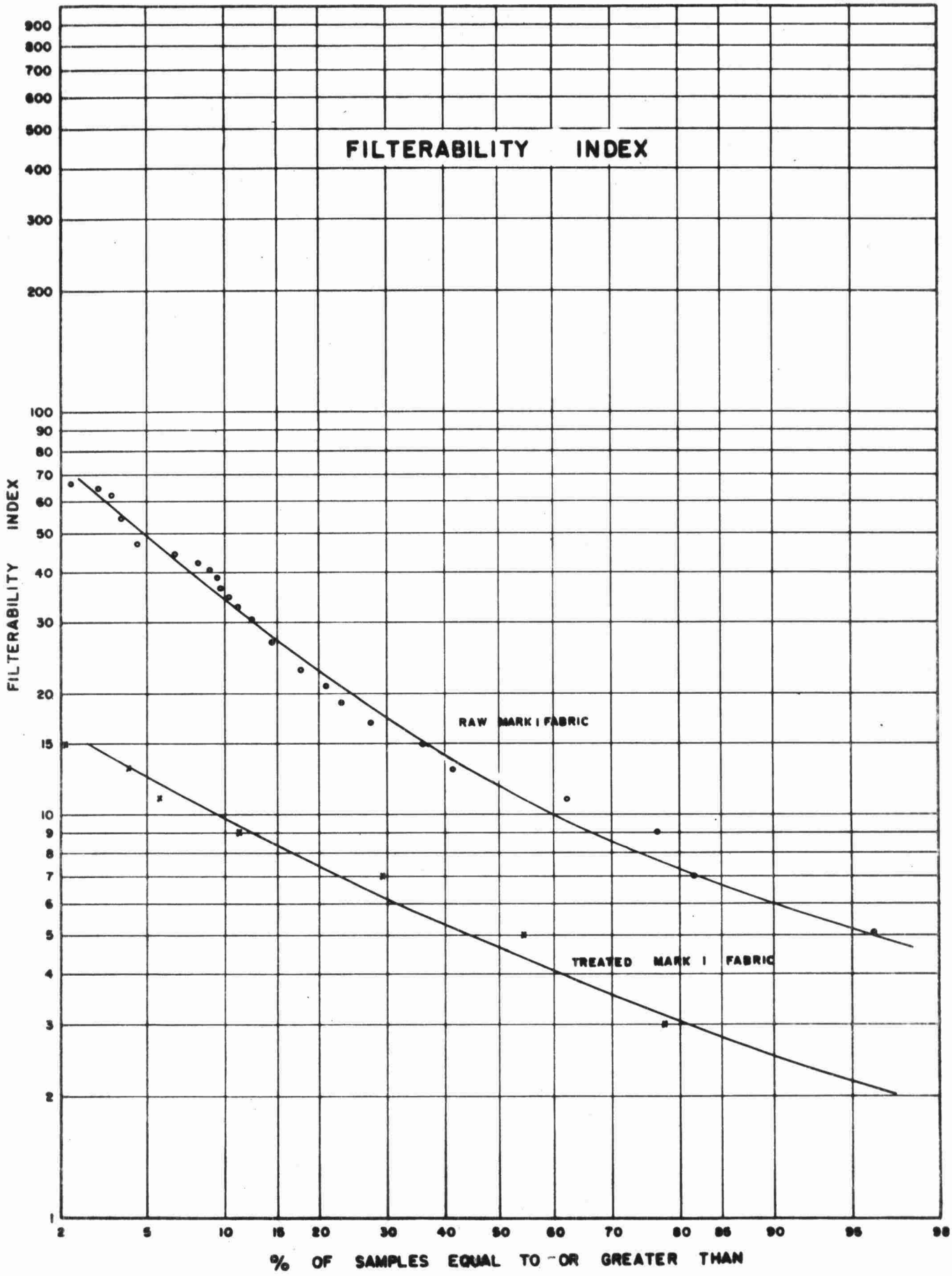
Most of the algae of importance in water supplies may be categorized into four general groups, the greens, blue greens, diatoms and flagellates. The enumerations performed at the Dunnville plant have revealed that the greatest portion of algae in this area of the lake came from the greens and diatoms. Microstrainers at the plant are successful in removing a great proportion of the algae in the raw water. The accompanying graph shows the seasonal variations of algae in the raw water.


ALGAE ENUMERATION RESULTS
1966
(RAW WATER)
TOTAL STANDARD AREAL UNITS/M.L.
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
900
800
700
600
500
400
300
200
100
5
10
15
20
25
30
35
40
45
50
WEEKS

FILTERABILITY

The filterability index has been developed in connection with microstrainers in order to measure their ability to filter water. The index is affected by the type of microstrainer fabric used and the quality, particularly turbidity, of the water to be filtered.

For a given fabric an increase in the index indicates a poorer quality of water which decreases the capacity of the microstrainers. For a given quality of water the index will increase with an increase in the fineness of the microstrainer fabric. The microstrainers at the plant are equipped with Mark I fabric having an aperture opening of 35 microns with 80,000 apertures per square inch.


FILTERABILITY INDEX
FILTERABILITY INDEX
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
RAW MARK I FABRIC
TREATED MARK I FABRIC
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% OF SAMPLES EQUAL TO OR GREATER THAN

CHLORINATION

MONTH	RESIDUAL	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	0.50	2486	0.87
FEBRUARY	0.50	1962	0.77
MARCH	0.50	2286	0.83
APRIL	0.50	2750	0.88
MAY	0.50	3216	0.97
JUNE	0.50	3238	0.94
JULY	0.50	4266	0.98
AUGUST	0.50	4236	1.03
SEPTEMBER	0.50	2454	1.04
OCTOBER	0.50	2728	0.88
NOVEMBER	0.50	2747	0.86
DECEMBER	0.50	2480	0.85
TOTAL	-	34849	-
AVERAGE	0.50	2904	0.92


ONTARIO WATER RESOURCES COMMISSION